

across the through opening. A thermal fuse is provided on the other surface of the circuit board to enter the through opening. This thermal fuse responds to the temperature of the electronic component via a heat-conducting insulating member filling the through opening for breaking the predetermined circuit. A through hole is provided in the circuit board. The thermal fuse is electrically connected to the predetermined circuit via the through hole.

Applicant's Admitted Prior Art illustrated in Figures 3A and 3B show that it was well known in the art at the time the invention was made to mount a thermal fuse 34 on the same surface of a circuit board 31 as electronic components 32. Thermal fuse 34 in these figures is thermally connected to electronic devices 32 with a heat-conducting insulating material such as silicon resin.

Applicant's Admitted Prior Art fails to teach the claimed invention since there is no teaching of the through opening with the thermal fuse and the electric components being arranged across the opening and on opposite sides of the circuit board. The Office Action cites Shirakawa as curing the deficiencies in Applicant's Admitted Prior Art.

Shirakawa discloses in Figure 2 that a through hole 9 (corresponds to Applicant's through opening) is formed in circuit board 3. A bare-chip semiconductor device 2 is provided within the through hole 9. A packaged semiconductor device 1 is provided above the circuit board 3. Semiconductor device 2 is connected to electrodes 5 with wires 6. The electrodes 5 are positioned within the through hole 9 with insulating resin 4. This insulating resin also covers the wires 6 and electrodes 5. Shirakawa reduces

the thickness of the overall package by making the connection between the semiconductor device 2 and circuit board 3 within through hole 9.

In contrast, the present invention provides a mount structure for a thermal fuse that allows the thickness of the package including thermal fuse, electronic component and circuit board to be reduced and at the same time sensitively detect the temperature of the mounted electronic component. As illustrated in Figures 1C and 1D, the lead 5 on either side of thermal fuse 4 is connected to electronic component 2 via through hole 1b. Thus, the lead 5 on either end of thermal fuse 4 is not placed between the thermal fuse 4 and the electronic component 2. In contrast, Shirakawa teaches placing the wires 6 and electrodes 5 between the semiconductor device 2 and the semiconductor device 1. The presence of wires 6 between semiconductor device 1 and semiconductor device 2 prevents the accurate measurement of the temperature of semiconductor device 1 (resistive heating of wires 6 and/or thermal conductance of wires 6).

Shirakawa teaches placing semiconductor device 2 in the through opening together with the electrodes 5 and wires 6. The presence of the electrodes and wires, however, reduces the accuracy of any temperature measurement taken of semiconductor device 1. Accordingly, Applicant believes that there is no motivation for providing only the thermal fuse of the prior art in the through hole of Shirakawa and providing the lead through a separate hole in the circuit board. Accordingly, Applicant respectfully requests reconsideration and withdrawal of the rejection of claims 1, 2, and 4 under 35 U.S.C. § 103(a).

## CONCLUSION

Applicant's' remarks have overcome the rejection set forth in the Office Action dated August 29, 2002. Specifically, Applicant's remarks have distinguished claims 1, 2, and 4 from the combination of Applicant's Admitted Prior Art and Shirakawa, and thus overcome the rejection of these claims under 35 U.S.C. § 103(a). Accordingly, claims 1, 2, and 4 are in condition for allowance. Therefore, Applicant respectfully requests consideration and allowance of claims 1, 2, and 4.

Applicant submits that the application is now in condition for allowance. If the Examiner believes the application is not in condition for allowance, Applicant respectfully requests that the Examiner contact the undersigned attorney by telephone if it is believed that such contact will expedite the prosecution of the application.

In the event that any additional fees are due with respect to the filing of this paper, the undersigned authorizes the Office to charge any additional fees to our Deposit Account No. 01-2300, making reference to Docket No. 100806-00001.

Respectfully submitted,

  
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Rustan J. Hill  
Registration No. 37,351

Customer No. 004372  
AREN'T FOX KINTNER PLOTKIN & KAHN, PLLC  
1050 Connecticut Avenue, N.W.,  
Suite 400  
Washington, D.C. 20036-5339  
Tel: (202) 857-6000  
Fax: (202) 638-4810  
RJH:elp  
Enclosure: Marked-Up Copy of Amended Claim  
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MARKED-UP COPY OF AMENDED CLAIM AS REQUIRED UNDER  
37 C.F.R. § 1.121

1. (Amended) A mount structure for thermal fuse on circuit board, comprising:
  - a circuit board having one surface where a predetermined circuit is formed;
  - a through opening provided in said circuit board;
  - an electronic component attached to the one surface of said circuit board to extend across said through opening; [and]
  - a thermal fuse provided on the other surface of said circuit board to enter said through opening, responding to temperature of said electronic component via a heat-conducting insulating member filling said through opening for breaking said predetermined circuit; and
  - a through hole provided in said circuit board, wherein said thermal fuse is electrically connected to said predetermined circuit via said through hole.